



Antique Wireless Association of Southern Africa Newsletter



230

September 2025



Collins 32S-3 Transmitter

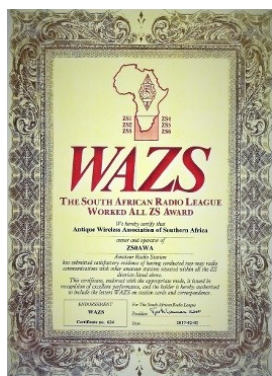
The **Collins 32S-3** is a high quality amateur band transmitter featuring CW, LSB and USB modes. Frequency ranges: 3.4-3.6, 3.6-3.8, 3.8-4, 7-7.2, 7.2-7.4, 14-14.2, 14.2-14.4, 14.8-15, 21-21.2, 21.2-21.4, 21.4-21.6 and 28.5-28.7 MHz plus 2 additional 200 kHz positions for 28-29.7 MHz and one additional position for a 200 kHz band in the 9.5-15 MHz range.

Power input is 175 watts PEP on SSB, 160 watts on CW.

Power output is 100 watts PEP nominal (slightly lower on 10 meters). Features include: multi-function meter, crystal controlled high frequency oscillator, automatic load control, and a highly accurate analog display with Fiduciary Adjust. Unlike the previous 32S-1, the 32S-3 features a CW spotting control which allows the 32S-3 frequency to be quickly adjusted to zero beat with the a signal tuned on the receiver.

The 32S-3 matches the Collins 75S-3 receiver.

Requires a power supply such as optional 516F-2.



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Chris's Musings

I don't know about you, but I often struggle to keep up with the updates, new features and bugs in desktop computers. Most of us have at least one computer in our shack. The lucky ones might have two or more.

I use a computer for work and until recently, I shared this computer with my amateur radio operations. It is an eight year old, HP desktop running Windows 10 Pro, sometimes with dual monitors.

About a year ago after installing the latest MS update, my machine started using large chunks of CPU time and RAM. After much research using Mr Google, I discovered something called Modern Setup Host. Stopping this service resolved the very slow operation. I finally fixed the problem a couple of months ago by downloading and installing the latest Windows 10 'deployment' image intended for system engineers. And just as I thought we were out the woods, MS announced that if we, as users, wanted ongoing support we would need to update to WINDOZE ELEVEN! And worse still... only if our hardware supported it.

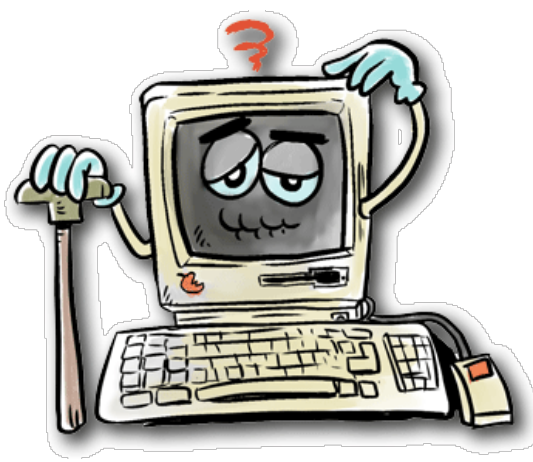
MS recommendation, buy a new computer that does support eleven or pay for updates, but only for a year. I can't afford a new computer, nor do I want to pay for an operating system I already own.

At this point, I must add that I dumped Microsoft Office a good many years ago and installed open source 'Libre Office', Thunderbird for my mail client and Firefox for browsing. Funny observation! I have no updates forced on me, I am able to successfully do all the tasks I need with the exception of Microsoft office Macros which are written in MS Visual Basic.

There are other alternative operating systems, Apple, Android and Linux with its derivatives. I have toyed with Linux running on an old laptop and on Raspberry Pi – Raspbian a slim version of Debian which shares most of its engine with Ubuntu.

But, the latest MS arrogance and complete disregard for home users and small business really got up my nose! I decided to take a serious look at Linux. There are a lot of different distributions (distros!) but for home use it seems Ubuntu as the engine room is the best choice. I finally settled on 'Mint' which uses Ubuntu under the hood and provides a graphical interface (GUI) very similar to Windows XP and Windows 7. You don't need to understand command line processing but if you want to play, the sky is your limit.

My first foray into Mint is on a 15 year old HP laptop previously running Windows Millennium. I downloaded and installed Linux Mint from a USB stick created using RUFUS. It installed cleanly, all the devices were recognised and it ran straight away. I next installed Opera Browser, Thunderbird Mail and Libre Office. They all ran first time and was immediately able to do 80% of my work, flawlessly. Libre Office Writer is completely compatible with all my work documents. I have a lot of technical programmes that run under windows 7 and Windows 10 with the Win 7 shell. I installed WINE (Windows In Linux Environment) and every program I installed 'just worked'! There are also loads more everyday Windows applications which also run under Linux. Anydesk, Team Viewer, Lt-Spice, KiCad, MicroCap, NEC4Win and the list keeps growing. Then, if you have lot of older ham software written for MS-DOS, Linux runs something called DOS-BOX.



If you do not need to run a Microsoft specific application or program, do yourself a favour and try Linux. It just works, you only update if you need to and, guess what?, it is backward compatible to the very beginning. None of your apps become redundant.

So, don't be put off. If this grey haired, technology resistant OM can get it going in no time at all, then you can!

Reflections:

When I started out on my ham radio journey in 1984, I never imagined that I would end up having made so many friends with similar interests, and I suppose there are so many whom one can mention that have played a part in building that interest. I don't think this page is big enough to mention them all, but I would like to mention one person in particular, and that is Barrie ZS6AJY.

I can't remember if I ever had a CW QSO with Barrie when I first started out with my ZS4 call sign, in those days the part of the Northern Cape where we were was classed Div 4, it was only changed later, but I am sure I must have met up with him some time during my quest for 200 CW contacts.

But my first QSO with him as a Div 6 operator was in 2005. After that it was a while before we formed the AWA CW group in 2008 and of course Barrie was one of the first to join in on the group. I had suggested to Om Rod ZS5RK (SK) that we should form a CW group as it was also part of our radio heritage to which he replied to me that I was welcome to do it. That of course was not my intention, but the job became mine.

The group grew quite fast and at one stage we were having almost 20 stations on the net on a Saturday afternoon, which we have managed to keep going since then. Of course today we have dwindled in numbers to three or four.

But I digress. I visited Barrie on the odd occasion as we exchanged more than just CW, to find out he had been a telegrapher with the Post Office, had spent time on Marion and Gough Islands as Communications Officer on a few occasions, before they even had phone.

Barrie lived and breathed morse code for most of his life.

He was an ardent member of the early morning group that would be up at sparrow every morning and spend a good amount of time chatting on CW.

Barrie has used a bug most of his CW life and sent flawless code on it. He also donated a gold plated key that he won in a world wide contest with Morsum Magnificat and a Vibroplex bug that stand proudly displayed in the SAIEE shack.

Today of course Barrie resides in a retirement village in Kempton Park with so much noise around, he cannot hear anything on his radio.

Barrie recently turned 94 and it was a privilege for me to have a phone

chat with him and hear that same voice, still filled with energy, although he says he doesn't get around much without a walker, one would have said that it did not sound that way.

I do believe that I could easily say that Barrie is the oldest member of the AWA. I am sure there will be a few who will try to beat this record, but I don't know how many will achieve it.



Barrie receiving the AWA CW Trophy at the 2016 AGM for his Promoting CW in the AWA.

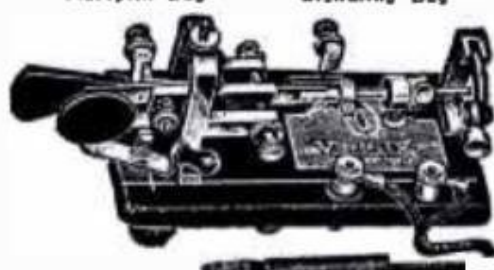
Thanks for your input into the world of CW Barrie.

Best 73

De Andy ZS6ADY

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Arthur A. Collins Legacy Association Celebrates 100th Anniversary of Major Radio Breakthrough in Cedar Rapids



See Collins' attic the way he did through Collins Aerospace Museum exhibit

A re-creation of the attic radio workroom of Arthur Collins is seen at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11. The room was built as a STEM project by Metro High School students. The Arthur A. Collins Legacy Association (AACL) is celebrating the 100th anniversary of Collins making contact with the MacMillan Arctic Expedition in Greenland using a high-frequency, 20-meter band radio technique. Collins was able to make contact and relay messages even when the U.S. Navy could not. (Jim Slosiarek/The Gazette)

CEDAR RAPIDS — Years before the first trans-Atlantic phone call, and decades before international direct dialing would become available, a Cedar Rapids teenager had a direct line to one of the most remote places on earth.

And decades before companies like Collins Radio and Rockwell Collins became multibillion dollar enterprises, a 15-year-old's ham radio was connecting Arctic explorers with the world from an attic on Fairview Drive.

On Aug. 3, 1925, Arthur A. Collins made headlines as the first person to communicate with MacMillan scientific explorers in Etah, Greenland on short-length radio waves — what The Evening Gazette in Cedar Rapids hailed as “a new chapter into the history of radio.”

For weeks, his rudimentary technology would be their lifeline to the Chief of Naval Operations at National Geographic, and the world.

It wasn't the first time he had communicated with the world. By then, he had talked wirelessly to people in Australia, Belgium, England, Guam, India, Mexico, Puerto Rico and Scotland.

But this thrill was the catalyst that would launch not only his own career, but the careers of thousands in Cedar Rapids whose technology continues to shape major world events to this day.

“He never had received a greater thrill than that when he talked to his friend on the famous expedition bound northward to explore a mystic continent,” The Gazette reported in 1925.

How he did it

Understanding the phenomenon of propagation in radio waves made it possible.

Near the turn of the 20th century, Italian inventor Guglielmo Marconi — who is largely credited with inventing the radio — started laying the groundwork for wireless telegraphy in the United Kingdom. But by 1925, the technology was still relatively archaic.

In the 1920s, the U.S. Navy, a sponsor of the Arctic expedition, was an ardent advocate for long-wave radio technology. But Collins and mentor John L. Reinartz, a pioneer of shortwave radio, had other ideas.

“(Collins has) got these inventions, all kinds of them,” said Mike Dupree, president of the Arthur A. Collins Legacy Associa-



Photographs of Arthur Collins' childhood home are seen at the Collins Aerospace Museum in northeast Cedar

tion. "But the bigger thing he does is take all these inventions and makes them work."

Longer radio waves, like the ones used by AM radio stations, tend to follow the surface of the earth and become weaker with distance. But with shorter, higher frequency waves, the ionosphere of the Earth's atmosphere reflects the signals back with "skips."



An enlargement of Arthur Collins' QSL card is seen at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11.

The cards are exchanged between ham radio operators after making contact via radio. The Arthur A. Collins Legacy Association (AACLEA) is celebrating the 100th anniversary of Collins making contact with the MacMillan Arctic Expedition in Greenland using a high-frequency, 20-meter band radio technique. Collins was able to make contact and relay messages even when the U.S. Navy could not. (Jim Slosiarek/The Gazette)

"They're experimenting and discovering what physicists had predicted was 'skip propagation' on shortwave frequencies, which is the ionosphere reflecting the signal back for long distances in day-

light," said Rod Blocksme, a founding member of the engineer. "It was a fabulous station by their standards."

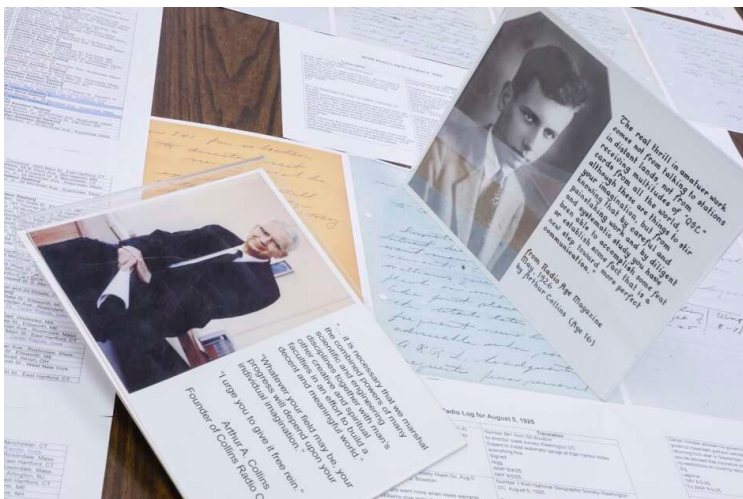
By 1925, Collins knew he could reach the East or West coast with just a couple skips. The ceiling of his attic setup, covered with "QSL" postcards from across the country, documented his morse code communications with amateur radio operators across the country — a custom between "hams" that serves as confirmation of their communication.

"I don't think they realized they were talking to a 15-year-old," said Blocksme.

For a while, Collins used a 50-watt transmitter that consumes less power than many light bulbs. Most amateur radio stations in 1925 had power levels of 50 watts or less.

For the MacMillan Expedition, Collins prepared a 1,000-watt transmitter on a "breadboard," with a \$110 vacuum tube purchased by his father — what would cost more than \$2,000 in today's dollars, if adjusted for inflation.

"Considering the state of electronics and radio in the 1920s, it's advanced," Blocksme said. "You know he had to have studied a lot on his own to figure all this out."



Portraits and writings of Arthur Collins are seen at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11. (Jim Slosiarek/The Gazette)

His understanding of propagation, as well as previous experiments with Reinartz, allowed them to reach Greenland in a way not understood by most.

Not even the United States Navy, whose confidence in long-wave radio failed the mission. As Collins received important messages and rode his bike to the Western Union station to telegraph them to the National Geographic Society, the Navy lost contact with the expedition.

The messages mostly contained Naval information. But a few offered novel insights into discoveries up north that left readers on the edge of their seats.

One day, Collins heard those aboard the U.S.S.

NEW!

RCA-6146



MAXIMUM ICAS* RATINGS		
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Plate voltage	750	435 volts
Plate current	150	150 ma
Plate input	90	65 watts
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Plate input	67.5	48 watts

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Here's a power tube that will outperform anything in its class. Rated to 175 Mc—only a trifle larger than a 2E26—the new RCA-6146 beam power tube is tailor-made for the amateur 2-meter band.

Rated at a heater voltage of 6.3 volts and current of 1.25 amperes, the RCA-6146 can deliver a CW output (ICAS) of approximately 69 watts at frequencies up to 60 Mc. At 150 Mc, the CW output (ICAS) is approximately 35 watts or better. An RCA-5763 or an RCA-2E26 is an excellent driver for this trim powerhouse.

It goes without saying that the new RCA-6146

incorporates all of the advantages of RCA beam power design . . . including the economy of a low-voltage power supply, and multi-band operation without the requirements of neutralization.

You'll want the full story on this new tube for amateur services. So, ask your local **RCA Tube Distributor** for the technical data bulletin or, write RCA, Commercial Engineering, Section AM48, Harrison, New Jersey.



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RADIO CORPORATION of AMERICA
ELECTRON TUBES

HARRISON, N. J.

Bowdoin sing “America.” Another later report noted that he missed an “Eskimo concert” broadcast by the MacMillan expedition when he wasn’t able to receive it.

Over the weeks of August 1925, he set records communicating via shorter and shorter radio waves as he moved from using 20-meter waves to 16.

“Biblical miracles were scarcely more weird than this one, and such an achievement as this would have been belittled vehemently 2,000 years ago,” The Gazette reported on Aug. 11, 1925.



A mock-up of the 1,000-watt transmitter “breadboard” is seen as Collins retiree and museum docent Rod Blocksome at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11.

Blocksome stands in a re-creation of the attic room used by Arthur Collins 100 years ago when Collins made contact with the MacMillan Arctic Expedition in Greenland using a high-frequency, 20-meter band radio technique. Collins was able to make contact and relay messages even when the U.S. Navy could not. (Jim Slosiarek/The Gazette)

The exhibit

Today, you don’t have to imagine how the birthplace of Collins’ legacy looks. Now, you can see it set up at the Collins Aerospace Museum in Cedar Rapids.

If you go:

Tours of the Collins Aerospace Museum are available every Wednesday from 11:30 a.m. to 1 p.m.

To arrange a visit of the Collins Aerospace Museum, visit thecollinsstory.org or contact Becky Woodward at

tours@thecollinsstory.org. Advance notice and a photo ID are required to participate in the tour.

The exhibit, which took residence at the museum in July, has interactive pieces, explanations that put a teenager’s social life into perspective, radio artifacts and a life-size replica of Collins’ attic radio station.

Through replica and actual radio parts, visitors can see what cutting edge communications technology looked like 100 years ago, and how Collins pushed it forward over the course of the 20th century.

Alongside the replica of his attic, radio equipment, rudimentary prototypes and scans of Collins’ scrapbooks and letters to National Geographic line tables.

Blocksome, who has been giving tours since 1996, has worked to enhance the museum in his retirement as a way to entice more students into science, technology, engineering and mathematics fields.

“This world is going to have to stand on technology, and we need more people in the tech fields to accomplish that,” he said. “This is one way of doing that.”

Collins’ legacy

Collins, whose father worked to make farming more efficient through an economy of scale, had innovation in his DNA. At a time when smaller family farms were more prevalent in Iowa, Collins Farms Co. was cultivating more than 25,000 acres in the Cedar Rapids area.



Collins retiree and museum docent Rod Blocksme speaks about Arthur Collins at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11. (Jim Slosiarek/The Gazette)

“What he was doing was highly innovative,” Dupree said.

Collins didn’t take the conventional routes to success. Though a technical genius, he dropped out of high school.

He later attended Coe College and other universities, but stopped short of graduating from each one. Dupree and Blocksme said his professors asked him more questions than he could ask them.

Collins retiree Mike Dupree speaks about Arthur Collins at the Collins Aerospace Museum in northeast Cedar Rapids on Aug. 11. (Jim Slosiarek/The Gazette)

As the Great Depression set in, Collins found success selling radio transmitters to international ham operators from his basement. By 1933, his company had eight employees and \$25,000 capital.

But despite his young age, quotes demonstrate that he understood the gravity of his breakthroughs and success — a progressive mindset that would come to define his work for decades to come.

“The real thrill in amateur work comes not from talking to stations in distance lands, not from receiving multitudes of ‘QSL’ cards from all the world, although these are things to stir your imagination,” he told Radio Age Magazine in May 1926, “but from knowing that by careful and painstaking work and by diligent and systematic study, you have been able to accomplish some feat or establish some fact that is a new step toward more perfect communication.”

In his own lifetime, Collins and his innovations have had a hand in reaching the Arctic, critical communications during World War II, the televised Moon landing, and more.

His nuanced leadership style was held together by a timeless, cohesive vision. The sky was the limit, and its only regulation was one’s imagination.

“It is necessary that we marshal the combined powers of many scientific and engineering disciplines together with man’s other creative and spiritual faculties in an effort to build a decent and meaningful world,” Collins said.

“Whatever your field may be, your progress will depend upon your individual imagination. I urge you to give it free reign.”

Collins was known for his aversion to media publicity and accepting attention for his work. Days before Apollo 11 landed on the Moon in 1969, he rejected an interview request from renowned broadcast journalist Walter Cronkite.

The late Myron “Mike” Wilson, the first director of quality assurance for Collins Radio Company, said he was an unusual leader — willing to dig into the details without bureaucratic barriers and, at times, willing to be laissez-faire.

“You could find him in a lab helping an engineer decide what the value of a capacitor could be. And yet, in the long ways, he could let hands off and let the management run the business,” Wilson said in an [unpublished 2022 interview with Wired Production Group](#). “Arthur knew where the company was going to go and was supposed to go. ... He could go off and concentrate on a single project because he knew that management would keep it going in the right direction.”

He was known to stay at work for 24 to 36 consecutive hours, getting by on “catnaps” at a “scrupulously spotless desk.” In addition to his dedication, he was known to think decades ahead of technological advances.

“In 1982, people didn’t have (personal computers) yet, but everybody in (Art’s) office had a Hewlett-Packard PC and he hooked them up to communicate with each other,” Ben Stearns, public relations manager of the Cedar Rapids Division in the 1960s and 1970s, said in a [2008 issue of a Rockwell Collins employee magazine](#). “In fact, the C-8400 Switching System they put together for the airlines was really an early forerunner of email and the internet.”

The museum docents and founders of the legacy association hope the next generation lets their imagination guide them, too.



Comments: Features reporter Elijah Decious can be reached at (319) 398-8340 or elijah.decious@thegazette.com.

COLLINS

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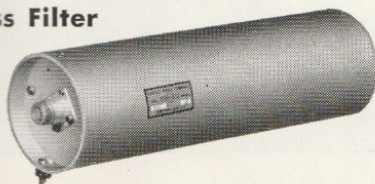
32V-3 TRANSMITTER

The Collins 32V-3 is a VFO controlled bandswitching vacuum-tube amateur transmitter, conservatively rated at 100 watts input on CW and 120 watts input on phone. It covers the 80, 40, 20, 15, 11 and 10 meter ham bands and is specifically engineered for reduction of TVI.

The cabinet of the 32V-3 is solid metal, open only in front to receive the chassis. Even the handhole at each end is lined. There is no liftable lid, and quarter-inch perforations replace slots for ventilation. Thus two types of leakage paths have been eliminated. Two pull handles have been added for easy removal of the panel and chassis. When firmly screwed in place, bare panel metal makes proper electrical contact with bare cabinet metal, eliminating another leakage path.

The entire r-f section of the 32V-3 has been completely enclosed in an outer shield of perforated metal which permits adequate ventilation while blocking radiation of troublesome harmonics.

35C-2 Low Pass Filter



A coaxial fitting is provided at the rear of the 32V-3 cabinet. This permits the use of a well shielded transmission line in which the Collins 35C-2 Low Pass Filter may be inserted. The 35C-2 is a 52 ohm three-section filter which, with approximately 0.2 db insertion loss below 29.7 mc, provides approximately 75 db attenuation of harmonic emissions at the television frequencies. This attenuation is added to that provided in the 32V-3. Unbalanced output permits grounding of the outer conductor of the line and the case of the filter.

Net Domestic Price \$40.00

Low pass filters are installed as follows: both sides of the a-c power line and the antenna relay line and both sides of the receiver disabling circuit; at the microphone connector and the key circuit; one in each lead to each of the two meters.

The r-f tube line-up: A 6SJ7 VFO, 6AK6 buffer, 6AG7, 7C5 and 7C5 frequency multipliers, and 4D32 final amplifier. Speech line-up: A 6SL7 in cascade to 6SN7 to a pair of 807 modulators, which furnish 60 watts audio power to modulate the final amplifier. The power supply contains a 5Z4 (low voltage) and two 5R4GY (high voltage) rectifiers, a VR75 bias regulator, one OA2 and one OB2 oscillator plate voltage regulators, and two OA2 screen voltage limiters.

Dimensions: 21 1/8" wide, 12 7/16" high, 13 7/8" deep

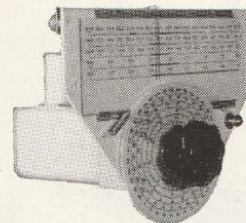
Power Source: 115 volts 50/60 cycles a-c

Shipping Weight: 133 pounds

Net Domestic Price \$775.00

70E-8A VFO

An extremely accurate, stable, variable frequency oscillator. The 70E-8A is permeability tuned, and has a linear range of 1600 kc to 2000 kc. Sixteen turns of the vernier dial are required to cover the 400 kc range. This oscillator is factory calibrated, using a secondary standard continually checked against WWV.



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(dial included) . . . \$97.50

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Technical Topics

Chris Turner, ZS6GM
August 2025

The SWR Meter.

The 'SWR' meter, more correctly the *Reflectometer*, sometimes referred to as a directional power meter can be found in most shacks. It is used to evaluate or adjust antenna systems. Standing wave ratio is a convenient method to define how well the load is matched to a transmission line. At the heart of every SWR meter or directional power meter is a device known as a *directional coupler*.

The basic principle of directional coupler operation is common to all varieties. Fig. 1 shows voltage and current at various points along a transmission line that is not terminated in its characteristic impedance. These are called standing waves because they have a fixed position for any given load impedance for distance in electrical degrees along a lossless transmission line. The wave shape is not a sine wave and is not to be confused with the shape of an RF cycle.

The directional coupler can sense either the forward or reflected component by taking advantage of the fact that the reflected components of voltage and current are 180 degrees out of phase while the forward components are in phase. A small voltage derived from the current in the line is added to a sample of the voltage across the line. If these two samples have the right amplitude relationship, the two reflected components cancel. The sum then represents only the forward component. By reversing the phase of the current sample 180 degrees, the forward components cancel and the result is the sum of only the reflected components.

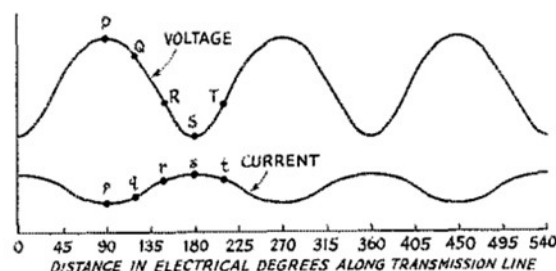


Fig. 1 Voltage and current standing waves as a function of distance towards the load on a lossless transmission line

The voltage plotted in Fig. 1 can be measured using an RF voltmeter, and the current, can be measured by cutting the line at various points and inserting an RF ammeter.

The readings are the rms value of the sine-wave RF voltage or current existing at each point. Note that a directional coupler measures induced voltage. Power indication is derived from the measured voltage.

There are two common varieties of directional coupler. The so called 'Monimatch', which uses the principle of coupled transmission lines, is mostly but not exclusively used, for VHF and UHF instruments. The other is the Bruene coupler invented by Warren Bruene, W0TTK used mostly in HF applications. Most modern transmitters and directional power meters use a variant of the Bruene coupler.

A current flowing in a transmission line will induce a current in the opposite direction on a closely coupled parallel line.

The Monimatch.

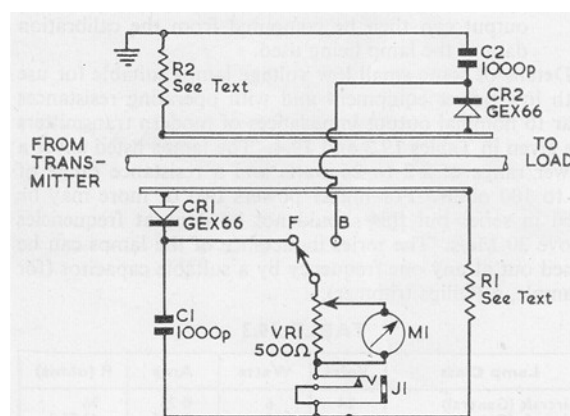


Fig. 2 The Monimatch

The forward wave induces a wave flowing in the opposite direction on the secondary [lower] line towards CR1 in Figure 2. This is a fundamental property of coupled lines. The detector CR1, receives a voltage proportional to the amplitude of the forward wave; transmitter to antenna. The Forward wave induced into the upper line is absorbed by R2, and so nothing reaches detector CR2. A return wave, reflected back towards the transmitter, induces a wave in the upper line, travelling towards CR2 and is rectified by CR2. Reflected energy is absorbed in R1 so no voltage appears at CR1. To summarise, a forward wave is rectified by CR1 and any return wave is rectified by CR2. The ratio between the two induced voltages is used to derive the reflection coefficient which in turn is used to compute SWR.

Bruene Coupler

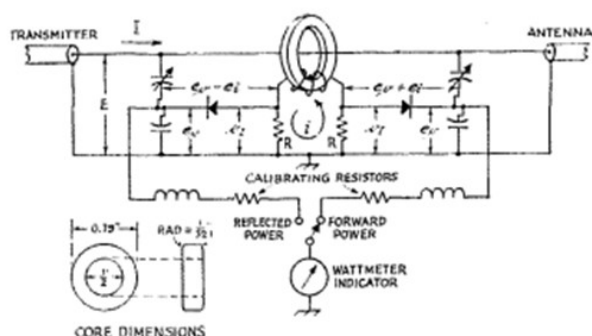


Fig. 3 The Bruene Coupler

The Bruene Coupler was used in the Collins 302C-3 Directional Wattmeter and was described in an article written by Warren Bruene in *QST* magazine ("An Inside Picture of Directional Wattmeters," *QST*, Apr., 1959).

The Bruene Coupler has a current transformer and two capacitive voltage dividers; one used to generate the V_{ref} voltage, the other used for the V_{fwd} voltage.

Line current passing through the 1-turn primary of a 1:60 turn transformer induces current in the 60-turn secondary. This current, in turn, is transformed into voltage as it passes through the two 10 ohm resistors. One voltage is positive with respect to ground, the other is negative. These two voltages represent the current sample. The V_{fwd} and V_{ref} voltages derived from the two capacitive dividers, add to or subtract from the current sample voltages, so that the DC voltage is a function of the phase and amplitude differences between the voltage and current samples.

Irrespective of what the load actually is, the Bruene Coupler provides voltage readings that can be inter-

preted in terms of Forward and Reflected waves. It is important to remember: *these readings should only be interpreted as representing actual Forward and Reflected waves when the Bruene Coupler is connected in a transmission line with the same characteristic impedance, Z_0 , as the Coupler's designed-for target impedance!*

Relationship between SWR, Load Impedance and Reflection Coefficient

Standing wave ratio (SWR) is a measure of how well a load is matched to a transmission line and is the ratio of the maximum voltage to the minimum voltage along the transmission line. SWR may be either voltage SWR or current SWR. Here is the equation for voltage SWR (VSWR).

The reflection coefficient (RC) quantifies how much of an electromagnetic wave is reflected due to an impedance mismatch in a transmission line. It is the ratio of the amplitude of the reflected wave to the amplitude of the incident wave denoted by the Greek letter Γ (gamma).

For a load impedance Z_L and characteristic impedance Z_0 , reflection coefficient Γ is calculated as:

SWR and the reflection coefficient are closely related. The relationship can be expressed mathematically:

Checking and Calibrating the SWR meter

To check the accuracy of your SWR meter, you need a non-reactive dummy load of 50 ohms and non-reactive test load of 150 ohms.

From the equations we know that a 150 ohm load will present a VSWR of 3:1 to a 50 ohm source. Therefore, use a 150 ohm load to test the accuracy of the VSWR meter.

Firstly, connect the 50 ohm load and check that the VSWR = 1:1. Then connect the 150 ohm load and check that the VSWR meter reads 3:1.

Then, reverse the transmitter and antenna connections and verify that the meter reads 3:1 when reversing the FWD and REV switch positions.

An SWR or power meter incorporating a Bruene directional coupler requires the phasing capacitor/s on the capacitive divider to be adjusted for a null. Most bridges only have a single capacitor. With a 50 ohm load connected, to the antenna port on the meter, key the transmitter on CW. With the meter set for maximum sensitivity in the Reverse position, adjust the capacitor for a null i.e. minimum deflection. If your meter has two capacitors, reverse the transmit and antenna connections and perform the same adjustment to the other capacitor on the Forward position.

Then perform the test with the 150 ohm load and adjust any calibration potentiometers for 3:1 SWR reading.

If your meter also measures power, you will need a well calibrated wattmeter or an RF (diode) probe and digital meter.

If using the diode probe method, connect the probe to a 'Tee' connector between the radio and load. Key the transmitter on CW and using the formula $P = V^2 / 50$ to calculate the power, adjust the calibration potentiometer on the in-line power meter for the calculated value. If for example, you measure 71 Volts rms, this equates to 100 Watts. Similarly, 32 Volts rms equates to 20 Watts. To calibrate reverse power, simply reverse the transmitter and antenna connections.

If using a calibrated power meter, insert it in line with the meter under test and using a CW signal, adjust the calibration potentiometers on the meter under test so that the two meters indicate same power.

Note: It is always best to calibrate a meter at half scale to obtain the best accuracy.

A note on return loss (RL).

Return loss is the logarithmic ratio of the power of the incident wave to the power of the reflected wave, expressed in decibels (dB). It indicates how much of the signal is "lost" due to reflection. A higher return loss, i.e. a larger positive number, indicates a better match and less reflected power.

The conversion from Reflection Coefficient to Return Loss is:

$$RL = -20\log_{10} RC$$

References:

RSGB - Radio Communication Handbook, 4th edition pg 19.26

Bruene, W. (1959). "An Inside Picture of Directional Wattmeters," QST, Apr., 1959

MODEL HFT-10K

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AWA Valve QSO Party

1. The aim of the AWA QSO party is to create activity on the 40 and 80 meter bands. It is a phone only contest.
2. Date : Sunday 05 October 2025.
3. Time. From 15:00 - 19:00 SAST
4. Preferably, Valve radio's, or radio's with valves in them may be used.
5. Frequencies - 80m 3,600 to 3650 Mhz
40m 7,050 to 7,100 Mhz and 7.130 to 7200Mhz (The frequency between 7.100 and 7.130 is contest free)
6. Exchange - call sign, RS and consecutive serial numbers starting at 001, plus type of radio used. eg HT37 Tx.
7. Scoring , (your radio)
All valve radio 3 points per contact
Hybrid (valve & solid state) 2 points per contact
Solid State Radio 1 point per contact
8. Certificates will be awarded to the first three places.
9. Sponsor : The Antique Wireless Association of Southern Africa (AWA).
10. An excel log sheet is available on the AWA website. Copy and paste the following link : [Downloads \(awasa.org.za\)](http://Downloads(awasa.org.za))
Look in "Other Downloads"

All contact logs to be sent to:

email: andyzs6ady@vodamail.co.za

(As from next year—2026— the format of the QSO Party will change having categories that will allow people using any radio to participate against radios of same types. Scores will be for class that you enter.)



All Valve



Solid State



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**Antique Wireless Association
of Southern Africa****Mission Statement**

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yesterday's radio's and associated equipment. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association. Join by logging in to our website.

Notices:**Net Times and Frequencies (SAST):**

Saturday 07:00 (05:00 UTC) — Western Cape SSB Net — 7.140; Every afternoon during the week from 17:00

Saturday 08:30 (06:30 UTC) — National SSB Net — 7.125;

Echolink — ZS0AWA-L;

ZS6STN Sandton repeater — 145.700

Kempton Park Repeater — 145.6625

Relay on 10.125 and 14.135 (Try all and see what suits you)

Saturday 14:00 (12:00 UTC) — CW Net — 7025

AWASA Telegram group:

Should you want to get on the AWA Telegram group where a lot of technical discussion takes place, send a message to Andy ZS6ADY asking to be placed on the group. This is a no-Nonsense group, only for AWA business. You must download the Telegram App first.+27824484368

SAIEE Open Day:

Saturday, 06 September from around 10h30 at the SAIEE in Observatory. 18a Gill Street.
 Come along for a pleasant time at the museum, nostalgic displays of our amateur heritage.
 Operate the museum station. ZS6IEE.
 Enjoy good company.

Hope to see you there.